Spotlight On...

Increasing Ventilation and Improving Air Quality in Schools

Council of the Great City Schools

Improving air quality and increasing ventilation in our school buildings is one of the most important steps districts need to take to prepare school facilities for the return of students, teachers, and staff during the COVID-19 crisis. The following recommendations offer simple and low-cost strategies, which, when used with other practices recommended by the Environmental Protection Agency (EPA)[1], the Centers for Disease Control and Prevention (CDC)[2], the Harvard School of Public Health's *Risk Reduction Strategies for Reopening Schools*[3], American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) R*eopening Schools and Universities*[4] and others, increasing ventilation can be part of a plan to help protect people indoors.

Recommendations for Maintaining Ventilation Systems

Ventilation in school buildings is provided through a combination of the following systems. These systems help increase ventilation, improve indoor air quality, and lower the potential for COVID-19 circulating in school buildings.

- Supply and exhaust fans that do not require operable windows.
- Windows and exhaust fans, and windows that have four percent of total square footage of the room opened when occupied.
- Combinations of supply, exhaust fans, and windows.
- HVAC Systems- roof top units, air handling units, central plant and dedicated outside systems in newer buildings, and univents.

To ensure that these ventilation systems are well-maintained and fully functional for the reopening of schools, districts should consider taking the following steps—

1 https://www.epa.gov/coronavirus/guidance-cleaning-and-disinfecting-public-spaces-workplaces-businesses-schools-and-homes

2 https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html

3 https://schools.forhealth.org/risk-reduction-strategies-for-reopening-schools/

4 https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools.pdf

5 Refer to ASHRAE Filtration and Disinfection system section for additional information. https://www.epa.gov/indoor-air-quality-iaq/what-merv-rating-1

Filter Changes – MERV 13

Filtration is an effective tool for removing respiratory droplets from the air, a critical aspect of healthy classrooms. We recommend that return air filters in HVAC systems be changed to a minimum MERV 13 filter (or equivalent) with the greatest depth allowed by the equipment, typically 2" where possible. When selecting the filter, review the pressure drop data and select a new filter that is like the old filter so that system performance won't be affected.[5]

If MERV 13 filters cannot be installed, consider the following options, e.g.,

- A mitigation measure to operate return air systems with 100% outside air.
- Provide a recirculation fan filtration unit and duct into the return of units.
- Provide portable HEPA filtration unit which re-circulates air within the space.
- Consider Air Ionization system or static charge on filters.
- Consider UV treatment but review location to avoid impacts of liners and other internal components.
- Consider alternate filter locations in return duct or grille but consider static pressure drop implications and relationship with outside air dampers.

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Daily Air Flush Out

One simple change that facilities departments can make is to change the control settings and schedules to increase the times that the ventilation systems and fans are running for a minimum of two hours in occupied mode, with peak outside air rate, before teachers and staff arrive each day.

Retro-Commissioning

As a long-term strategy, districts should establish a proper unit baseline for ventilation, operation, and condition by having your sites retroactively commissioned so that equipment, ductwork, and controls meet standards and are providing the intended ventilation rate based on planned capacity.

Measure and Monitor CO2

Automated or hand-held devices can be used to measure CO2 levels in buildings and classrooms to determine if sufficient ventilation is being provided when they are occupied.

Open Doors and Windows

One critical and simple strategy that schools can use to improve ventilation rates in cases where there is no central HVAC is to open doors and windows two hours before occupancy and at other times throughout the day.

Preventive Maintenance Inspections and Repairs

Regularly scheduled HVAC preventive maintenance inspections should also be conducted to ensure units and systems are operating properly and providing adequate ventilation. An effective maintenance and repair program should include—

- Maintaining all HVAC systems regularly, replacing belts, and adjusting linkages and damper controls to ensure proper operation so the maximum amount of outside air is entering the school buildings.
- Opening outside air dampers and using the building management system or adjusting manually if required.
- Cleaning, replacing, or modifying air filters to ensure that they are cleaned, replaced, or modified as required.
- Ensuring lower window sash frames have stops limiting their opening to 4".

The following checklist provides steps that support these systems.

GENERAL

- ☐ Assess existing indoor air quality issues and address.

NATURAL VENTILATION

- ☐ Use natural ventilation when possible and safe to do so.
  - Make sure windows can open and stay open.
  - Make sure open windows are not a fall hazard—install window guard as appropriate.
  - Use window fans to promote air flow into a space (if not placed where it blows from one person to another or presents excess noise).

MECHANICAL VENTILATION

- ☐ Make sure ventilation systems or units are working properly.
- ☐ Ensure systems are properly cleaned such as univents, outside air intakes,etc.
- ☐ Perform semi-annual/annual scheduled equipment maintenance.
- ☐ Review air distribution conditions of existing spaces.
  - Increase total airflow supply to occupied spaces, if possible.
- ☐ Maximize fresh outdoor air/ avoid or minimize indoor air recirculation.
- ☐ Improve central air filtration when used.
  - Increase air filtration to as high a level as possible without significantly diminishing design airflow.
  - Inspect filter housing and racks to ensure appropriate filter fit and check to minimize filter bypass.
- ☐ Make sure bathrooms and restrooms have operating exhaust fans and are working properly.

- Consider running HVAC systems at maximum outside airflow for two hours before and after spaces are occupied, in accordance with manufacturer's instructions or recommendations.
  - Operate mechanical systems for at least one week before reopening schools, while making sure that outside air dampers are open.
- Use the highest rated filtration compatible with the currently installed filter rack and air handling systems—at a minimum MERV-13 or industry equivalent or greater (e.g., HEPA).
- Change HVAC filters regularly.
- Make sure HVAC condensation pans are draining.
- Make sure roof exhaust fans operate properly (air flows out).
- Keep roof air intakes open, even at minimum setting.
- Make sure that vents in chemical and trash storage areas are operating properly.
- Remove obstructions in supply and exhaust vents.
- Remove obstructions—such as nests—blocking or near air intakes.

ADVANCED AIR QUALITY TECHNIQUES

- Attempt to maintain relevant indoor humidity between 40 percent and-60 percent.
- If unable to get enough fresh air into a room, use a HEPA air purifier/cleaner.

OTHER TECHNIQUES

- Make sure air from plumbing stacks and exhaust outlets flows away from outdoor roof air intakes.
- Identify potential sources of air contaminants near the building (e.g., chimneys, stacks, industrial plants, or exhaust from nearby buildings).
- Use chemicals only with adequate ventilation and when building is unoccupied.
- Check for combustion gas and fuel odors and identify source of smells.
- Make sure that combustion appliances (e.g., water heaters, ovens) are well maintained and have flues or exhaust hoods.
- Make sure there is no soot on inside or outside flue components.
- Pour water down floor drains (approximately one quart of water) and sinks (about two cups of water) once per week to ensure proper drain trap maintenance.
- Flush toilets at least once per week to ensure proper drain trap maintenance.
- Minimize use of pesticides to the extent possible.
- Move dumpsters and trash bins away from doors, windows, and outdoor air intakes.
- Discourage drivers from idling vehicles near outdoor air intakes.

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